REMARKS

This is a full and timely response to the non-final Official Action mailed **December 5, 2006**. Reconsideration of the application in light of the above amendments and the following remarks is respectfully requested.

Claim Status:

Claims 38-66 were withdrawn under a previous Restriction Requirement. To expedite the prosecution of this application, withdrawn claims 38-66 have been cancelled by the present paper. The withdrawn claims are cancelled without prejudice or disclaimer. Applicant reserves the right to file any number of continuation or divisional applications to the withdrawn claims or to any other subject matter described in the present application.

By the present paper, no other claims are cancelled. Claim 12 has been amended. New claims 67-86 have been added. Thus, claims 1-37 and 67-68 are currently pending for further action.

Allowable Subject Matter:

In the recent Office Action, the Examiner indicated that claims 12-14 and 27-29 contain allowable subject matter. Applicant wishes to thank the Examiner for this finding of allowable subject matter.

Accordingly, claim 12 has been amended and rewritten herein as an independent claim. Therefore, based on the Examiner's indication of allowable subject matter, following entry of this amendment, claims 12-14 should be in condition for immediate allowance. New claims 67-74 depend from newly-independent claim 12 and are, therefore, also in condition for immediate allowance.

Prior Art:

The recent Office Action rejects claims 1, 2, 5, 6, 9, 15, 16, 20, 21, 24, 31, 32 and 34-36 under 35 U.S.C. § 103(a) based on the combined teachings of U.S. Patent No. 5,395,704 to Barnett et al. ("Barnett") and U.S. Patent No. 6,668,207 to Montcalm et al. ("Montcalm"). For at least the following reasons, this rejection is respectfully traversed.

Claim 1 recites:

> A method of forming a thin-film fuel cell electrode, comprising:
> providing a substrate and at least one deposition device;
> developing a deposition characteristic profile having *at least one porous layer based on pre-determined desired electrode properties*; and
> forming a film in accordance with said deposition characteristic profile by depositing material from said deposition device while varying a relative position of said substrate in relation to said deposition device with respect to at least a first axis.

(Emphasis added).

Applicant's specification explains the importance of forming a fuel cell electrode including "at least one porous layer." According to Applicant's specification, "the present process provides desired and unique thin-film architecture. Film composition and porosity/density are adjusted with a periodicity through the bulk film. Modulation of the porosity enables improved mechanical performance of the films. Adjusting the film composition in concert with film porosity modulation improves catalytic reaction rate and mobility of the active species because surface mobility rates are significantly higher than bulk mobility rates." (Applicant's specification, paragraph 0042).

> As described, the present method provides a way for thin film electrodes to be made with precise control of compositional and morphological gradients through the film thickness. Such films have superior volumetric energy (energy per 1 μm of thickness) as anode and cathode of SOFC. Stability of anode (cermet) to red-ox cycling is also improved due to the presence of "nano-chambers" connected by less porous material (in z-direction). As a result, thin-film SOFC performance may be up to 850 mW/cm² or higher. In addition, the thin-film architecture by definition requires less material than other solutions.

(Applicant's specification, paragraph 0038).

In contrast, the proposed combination of prior art fails to teach or suggest "developing a deposition characteristic profile having *at least one porous layer*." (Emphasis added). The proposed combination of prior art further fails to teach or suggest developing such a deposition characteristic profile "*based on pre-determined desired electrode properties.*" (Emphasis added).

Barnett teaches using magnetron sputtering to form fuel cell electrodes. (Barnett, abstract). However, Barnett expressly teaches away from the claimed porosity or "at least one porous layer" of such an electrode. According to Barnett, the electrode films should be dense, not porous. "Dense, crack-free films may be produced. These denser films have lower permeability and allow a thinner [electrolyte] to be used, which is advantageous from the cost and space savings standpoints." (Barnett, col. 2, lines 4-8).

Barnett further expressly teaches a layer density *above* the definition provided by Applicant for a "porous layer." Applicant's specification defines a porous layer as follows. "As used herein and in the appended claims, ... a porous layer shall be broadly understood to mean a layer having a porosity of about 25% or greater and a dense layer shall be broadly understood to mean a layer having a porosity of less than about 25%." (Applicant's specification, paragraph 0024). In direct contrast, Barnett teaches film densities above about 75% and preferably greater than 85%. (Barnett, col. 4, lines 61-65).

Thus, the proposed combination of prior art does not teach or suggest a method that includes forming a *porous* layer for a fuel cell electrode. To the contrary, Barnett expressly teaches away from this claimed concept, and Montcalm does not teach or suggest anything about fuel cell electrodes. For at least this reason, the rejection of Applicant's claims based on Barnett and Montcalm should be reconsidered and withdrawn.

Additionally, the proposed combination of prior art references fails to teach or suggest developing such a deposition characteristic profile "*based on pre-determined desired electrode properties.*" (Emphasis added). The recent Office Action concedes that Barnett does not teach or suggest this subject matter. (Action of 12/5/06, p. 3). Consequently, the Office Action cites to Montcalm.

However, Montcalm has nothing to do with the formation of fuel cell electrodes and, therefore, cannot teach or suggest "developing a deposition characteristic profile having at least one porous layer *based on pre-determined desired electrode properties.*" (Emphasis added).

In the first place, Montcalm teaches using vapor or sputtering deposition primarily to form *optical films.* (Montcalm, col. 1, lines 34-40 and col. 4, lines 29-40). Montcalm does not ever teach, suggest or even mention using a thin film to form an electrode as in a fuel cell. Consequently, Montcalm cannot possibly teach or suggest the claimed "developing a deposition characteristic profile having at least one porous layer *based on pre-determined desired electrode properties.*" (Emphasis added). Neither of the cited prior art references teach or suggest this subject matter.

Moreover, Montcalm teaches profiles that only govern the "thickness" of a deposited layer. (Montcalm, col. 7, lines 29-33). Montcalm does not teach, suggest or even mention porous layers. Thus, Montcalm cannot teach or suggest "developing a deposition characteristic profile" that includes porosity, i.e., "at least one porous layer," as claimed.

Thus, the proposed combination of prior art fails to teach or suggest "developing a deposition characteristic profile having *at least one porous layer.*" (Emphasis added). Additionally, the proposed combination of prior art further fails to teach or suggest

developing such a deposition characteristic profile "*based on pre-determined desired electrode properties.*" (Emphasis added).

"To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least these reasons, the rejection of Applicant's claims should be reconsidered and withdrawn.

Additionally, the various dependent claims of the application recite subject matter that is not taught or suggested by the prior art of record. Specific, non-exclusive examples follow.

Claims 4 and 19 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Barnett, Montcalm and Ueda (Japan 63-195263) (of record). This rejection is respectfully traversed for the same reasons given above with respect to claim 1 and for at least the following additional reasons.

Claim 4 recites "wherein forming said film further comprises varying an applied magnetic field." Claim 19 recites similar subject matter. The Office Action concedes that Barnett and Montcalm fail to teach or suggest this subject matter. (Action of 12/5/06, p. 5). Consequently, the Action cites Ueda. (*Id.*).

Ueda teaches a "means of regulating magnetic flux density in a discharge atmosphere on a target of a magnetic body so as to enable stable magnetron discharge at all times" "[t]o successively obtain *homogenous thin film.*" (Ueda, abstract). Thus, Ueda teaches using a means of regulating magnetic flux to form a *homogenous* thin film. Consequently, Ueda teaches away from the claimed method of varying an applied magnetic field to form, not a homogenous layer, but a "porous layer" as claimed.

Thus, the propose combination of prior art references fails to teach or suggest the subject matter of claims 4 and 19. For at least these additional reasons, the rejection of claims 4 and 19 should be reconsidered and withdrawn.

Claims 7, 8, 10, 11, 18, 22, 25, 26, 30 and 33 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Barnett, Montcalm and Kobayashi (Japan 05-021347) (of record). This rejection is respectfully traversed for the same reasons given above with respect to claim 1 and for at least the following additional reasons.

Claim 8 recites "varying a speed with which said substrate passes said deposition device." Claims 11 and 26 recites similar subject matter. The Office Action concedes that Barnett and Montcalm fail to teach or suggest this subject matter. (Action of 12/5/06, p. 6). Consequently, the Action cites Kobayashi (*Id.*).

However, Kobayashi teaches varying the distance and angle between a deposition device and a target substrate. (Kobayashi, abstract). Kobayashi does not teach or suggest varying the speed at which the substrate passes the deposition device as recited in claim 8. For at least this additional reason, the rejection of claims 8, 11 and 26 should be reconsidered and withdrawn.

Claims 3 and 17 were rejected under 35 U.S.C. § 103(a) over the combined teachings of Barnett, Montcalm and Tasi (of record).

Claim 23 was rejected under 35 U.S.C. § 103(a) over the combined teachings of Barnett, Montcalm and U.S. Patent No. 6,364,956 to Wang et al. ("Wang").

Claim 37 was rejected under 35 U.S.C. § 103(a) over the combined teachings of Barnett, Montcalm and U.S. Patent No. 5,773,162 to Surampudi et al. ("Surampudi").

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All these rejections are respectfully traversed for at least the same reasons given above with respect to the ineffective rejection of claim 1 based on Barnett and Montcalm. Therefore, all these rejections should be reconsidered and withdrawn.

Conclusion:

The newly added claims 75-86 are thought to be patentable over the prior art of record for at least the same reasons given above with respect to the original independent claim 1. Therefore, examination and allowance of the newly added claims is respectfully requested.

For the foregoing reasons, the present application is thought to be clearly in condition for allowance. Accordingly, favorable reconsideration of the application in light of these remarks is courteously solicited. If the Examiner has any comments or suggestions which could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number listed below.

Respectfully submitted,

DATE: March 5, 2007

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